

PRELIMINARY AIRFOIL DESIGN FOR LOW REYNOLDS NUMBERS

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INTRODUCTION

Advances in the fields of electronics, batteries, and electric motors have enabled broad adoption of small-scale aircraft for various terrestrial applications. Numerous Micro Aerial Vehicles (MAVs) and small Unmanned Aerial Vehicles (UAVs), both civil and military, are in use today. Operation at their design flight condition often requires rotors, propellers, or wings to perform at Reynolds numbers significantly below 500,000 [1].

Airfoil performance at low Reynolds numbers is generally characterized by low aerodynamic performance (i.e. the attainable lift-to-drag ratio) compared to performance of airfoils at higher Reynolds numbers. The critical chord-based Reynolds number for conventional airfoil lies around $Re_c = 100,000$ to $Re_c = 500,000$ [2]. Below this critical Reynolds number, laminar separation of the boundary layer is usually the cause for poor performance. Researchers have found that below the critical Reynolds number, flat and cambered plates can outperform smooth airfoils. Circular-arc cambered plates especially have remarkable performance advantages, compared to conventional airfoil shapes [3].

AIRFOIL GEOMETRY

A preliminary airfoil is designed to evaluate performance at low Reynolds numbers. The airfoil is presented in Appendix A.

The airfoil is represented as two-dimensional x,y-coordinates. The point density is increased near smaller features (i.e. the leading and trailing edges) to ensure any required splining of the geometry would follow naturally. Care is taken to yield a design which despite the thin profile, would still be manufacturable at most realistic chord lengths.

For analyses, care must be taken that features of the airfoil might not be suitable for integral boundary layer analyses (viscous-inviscid interaction methods) due to the low thickness of the airfoil and the difficulty in ensuring accurate transition predictions. Higher-order analyses face similar problems, in that practical prediction of transition behavior is an on-going research field at the low Reynolds number range.

REFERENCES

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- [2] Hoerner, S. F. *Fluid-Dynamic Drag: Practical Information on Aerodynamic Drag and Hydrodynamic Resistance*. Hoerner Fluid Dynamics, 1965.
- [3] Lissaman, P. B. S. "Low-Reynolds-Number Airfoils." *Annual Review of Fluid Mechanics*, Vol. 15, No. 1, 1983, pp. 223–239.

APPENDIX A

The preliminary airfoil coordinates are presented in Table 1.

Table 1. Preliminary Airfoil Coordinates

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.999999	0.000057	0.996799	0.002026	0.987195	0.004389	0.971188	0.008169
0.999995	0.000115	0.996669	0.002058	0.986937	0.004452	0.970803	0.008257
0.999988	0.000173	0.996537	0.002091	0.986678	0.004514	0.970415	0.008347
0.999980	0.000232	0.996403	0.002125	0.986415	0.004578	0.970024	0.008436
0.999968	0.000290	0.996266	0.002159	0.986150	0.004642	0.969631	0.008526
0.999954	0.000349	0.996126	0.002194	0.985882	0.004707	0.969236	0.008617
0.999937	0.000408	0.995984	0.002229	0.985612	0.004772	0.968837	0.008707
0.999918	0.000466	0.995840	0.002265	0.985339	0.004838	0.968437	0.008799
0.999896	0.000525	0.995692	0.002302	0.985064	0.004904	0.968033	0.008891
0.999872	0.000583	0.995543	0.002339	0.984786	0.004971	0.967627	0.008983
0.999845	0.000641	0.995390	0.002377	0.984506	0.005038	0.967219	0.009076
0.999816	0.000699	0.995235	0.002415	0.984223	0.005106	0.966808	0.009169
0.999784	0.000755	0.995078	0.002455	0.983937	0.005175	0.966394	0.009263
0.999749	0.000812	0.994918	0.002494	0.983649	0.005244	0.965978	0.009357
0.999712	0.000867	0.994755	0.002535	0.983358	0.005313	0.965559	0.009451
0.999672	0.000922	0.994590	0.002576	0.983065	0.005383	0.965138	0.009546
0.999630	0.000975	0.994422	0.002617	0.982769	0.005454	0.964714	0.009642
0.999585	0.001028	0.994252	0.002660	0.982471	0.005525	0.964288	0.009738
0.999538	0.001079	0.994079	0.002702	0.982170	0.005597	0.963859	0.009834
0.999488	0.001129	0.993903	0.002746	0.981867	0.005669	0.963427	0.009931
0.999435	0.001177	0.993725	0.002790	0.981561	0.005742	0.962993	0.010028
0.999380	0.001224	0.993545	0.002835	0.981252	0.005816	0.962557	0.010125
0.999323	0.001268	0.993362	0.002880	0.980941	0.005890	0.962117	0.010223
0.999262	0.001311	0.993176	0.002926	0.980627	0.005964	0.961676	0.010322
0.999200	0.001351	0.992988	0.002972	0.980311	0.006039	0.961231	0.010421
0.999134	0.001389	0.992797	0.003019	0.979992	0.006115	0.960784	0.010520
0.999067	0.001424	0.992604	0.003067	0.979671	0.006191	0.960335	0.010620
0.998996	0.001457	0.992408	0.003115	0.979347	0.006267	0.959883	0.010720
0.998923	0.001486	0.992209	0.003164	0.979020	0.006344	0.959428	0.010820
0.998848	0.001511	0.992008	0.003214	0.978691	0.006422	0.958971	0.010921
0.998769	0.001533	0.991805	0.003264	0.978359	0.006500	0.958511	0.011023
0.998689	0.001552	0.991599	0.003314	0.978025	0.006579	0.958049	0.011125
0.998606	0.001573	0.991390	0.003366	0.977688	0.006658	0.957584	0.011227
0.998520	0.001595	0.991179	0.003418	0.977349	0.006738	0.957117	0.011329
0.998431	0.001617	0.990965	0.003470	0.977007	0.006818	0.956647	0.011432
0.998340	0.001640	0.990748	0.003523	0.976663	0.006899	0.956174	0.011536
0.998247	0.001663	0.990529	0.003577	0.976316	0.006980	0.955699	0.011639
0.998151	0.001687	0.990308	0.003631	0.975966	0.007061	0.955222	0.011743
0.998052	0.001712	0.990084	0.003686	0.975614	0.007144	0.954742	0.011848
0.997951	0.001737	0.989857	0.003741	0.975259	0.007226	0.954259	0.011953
0.997847	0.001763	0.989628	0.003797	0.974902	0.007310	0.953774	0.012058
0.997741	0.001790	0.989396	0.003854	0.974542	0.007393	0.953286	0.012164
0.997632	0.001817	0.989162	0.003911	0.974180	0.007478	0.952795	0.012270
0.997521	0.001845	0.988925	0.003969	0.973815	0.007562	0.952302	0.012376
0.997407	0.001874	0.988685	0.004027	0.973447	0.007647	0.951807	0.012483
0.997290	0.001903	0.988443	0.004086	0.973077	0.007733	0.951309	0.012590
0.997171	0.001933	0.988199	0.004146	0.972705	0.007819	0.950808	0.012697
0.997050	0.001963	0.987952	0.004206	0.972329	0.007906	0.950305	0.012805
0.996925	0.001994	0.987702	0.004266	0.971952	0.007993	0.949799	0.012914
		0.987450	0.004327	0.971571	0.008081	0.949290	0.013022

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.948780	0.013131	0.919326	0.019081	0.883212	0.025513	0.840437	0.031941
0.948266	0.013240	0.918682	0.019204	0.882437	0.025641	0.839531	0.032064
0.947750	0.013350	0.918036	0.019327	0.881660	0.025769	0.838623	0.032186
0.947231	0.013460	0.917386	0.019450	0.880880	0.025896	0.837713	0.032308
0.946710	0.013570	0.916735	0.019574	0.880098	0.026024	0.836800	0.032430
0.946186	0.013681	0.916080	0.019697	0.879313	0.026152	0.835884	0.032551
0.945660	0.013792	0.915423	0.019821	0.878525	0.026279	0.834966	0.032673
0.945131	0.013903	0.914764	0.019945	0.877735	0.026407	0.834046	0.032794
0.944600	0.014015	0.914102	0.020069	0.876943	0.026535	0.833122	0.032914
0.944066	0.014126	0.913437	0.020194	0.876148	0.026662	0.832197	0.033035
0.943529	0.014239	0.912770	0.020318	0.875350	0.026790	0.831268	0.033155
0.942990	0.014351	0.912101	0.020443	0.874550	0.026918	0.830337	0.033275
0.942449	0.014464	0.911428	0.020568	0.873747	0.027045	0.829404	0.033395
0.941904	0.014577	0.910753	0.020693	0.872941	0.027173	0.828468	0.033515
0.941358	0.014691	0.910076	0.020818	0.872133	0.027300	0.827529	0.033634
0.940808	0.014805	0.909396	0.020943	0.871323	0.027427	0.826588	0.033753
0.940256	0.014919	0.908714	0.021068	0.870509	0.027555	0.825644	0.033872
0.939702	0.015033	0.908028	0.021194	0.869694	0.027682	0.824698	0.033991
0.939145	0.015148	0.907341	0.021319	0.868876	0.027809	0.823749	0.034109
0.938585	0.015263	0.906651	0.021445	0.868055	0.027936	0.822798	0.034227
0.938023	0.015378	0.905958	0.021571	0.867231	0.028063	0.821844	0.034344
0.937459	0.015494	0.905263	0.021697	0.866405	0.028190	0.820887	0.034462
0.936891	0.015610	0.904565	0.021823	0.865577	0.028317	0.819928	0.034579
0.936321	0.015726	0.903864	0.021949	0.864746	0.028444	0.818966	0.034695
0.935749	0.015842	0.903161	0.022076	0.863912	0.028571	0.818002	0.034812
0.935174	0.015959	0.902456	0.022202	0.863076	0.028697	0.817035	0.034928
0.934597	0.016076	0.901748	0.022329	0.862237	0.028824	0.816066	0.035044
0.934016	0.016193	0.901037	0.022455	0.861396	0.028950	0.815094	0.035159
0.933434	0.016311	0.900324	0.022582	0.860552	0.029076	0.814120	0.035274
0.932849	0.016429	0.899608	0.022709	0.859706	0.029202	0.813143	0.035389
0.932261	0.016547	0.898889	0.022836	0.858857	0.029329	0.812163	0.035503
0.931671	0.016665	0.898169	0.022963	0.858005	0.029454	0.811181	0.035618
0.931078	0.016784	0.897445	0.023090	0.857151	0.029580	0.810196	0.035731
0.930482	0.016903	0.896719	0.023217	0.856295	0.029706	0.809209	0.035845
0.929884	0.017022	0.895990	0.023344	0.855435	0.029831	0.808219	0.035958
0.929284	0.017141	0.895259	0.023471	0.854574	0.029957	0.807227	0.036071
0.928681	0.017261	0.894525	0.023599	0.853709	0.030082	0.806232	0.036183
0.928075	0.017380	0.893789	0.023726	0.852842	0.030207	0.805234	0.036295
0.927467	0.017500	0.893050	0.023853	0.851973	0.030332	0.804234	0.036406
0.926856	0.017621	0.892309	0.023981	0.851101	0.030457	0.803231	0.036518
0.926242	0.017741	0.891565	0.024108	0.850226	0.030582	0.802226	0.036629
0.925627	0.017862	0.890818	0.024236	0.849349	0.030706	0.801218	0.036739
0.925008	0.017983	0.890069	0.024363	0.848469	0.030831	0.800208	0.036849
0.924387	0.018104	0.889318	0.024491	0.847587	0.030955	0.799195	0.036959
0.923763	0.018225	0.888563	0.024619	0.846702	0.031079	0.798180	0.037068
0.923137	0.018347	0.887807	0.024746	0.845815	0.031202	0.797162	0.037178
0.922509	0.018469	0.887047	0.024874	0.844925	0.031326	0.796141	0.037287
0.921877	0.018591	0.886285	0.025002	0.844032	0.031450	0.795118	0.037396
0.921243	0.018713	0.885521	0.025130	0.843137	0.031573	0.794092	0.037504
0.920607	0.018835	0.884754	0.025257	0.842240	0.031696	0.793064	0.037613
0.919968	0.018958	0.883984	0.025385	0.841339	0.031819	0.792033	0.037721

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.791000	0.037829	0.734902	0.042957	0.672143	0.047055	0.602722	0.049695
0.789964	0.037937	0.733735	0.043049	0.670846	0.047122	0.601295	0.049729
0.788925	0.038044	0.732566	0.043140	0.669546	0.047189	0.599864	0.049763
0.787884	0.038151	0.731395	0.043231	0.668244	0.047255	0.598431	0.049796
0.786841	0.038258	0.730220	0.043321	0.666939	0.047320	0.596996	0.049828
0.785795	0.038365	0.729044	0.043411	0.665631	0.047385	0.595558	0.049859
0.784746	0.038472	0.727864	0.043501	0.664321	0.047449	0.594117	0.049890
0.783695	0.038578	0.726682	0.043590	0.663009	0.047513	0.592674	0.049920
0.782641	0.038684	0.725498	0.043679	0.661694	0.047576	0.591229	0.049949
0.781584	0.038790	0.724311	0.043767	0.660376	0.047639	0.589780	0.049978
0.780525	0.038895	0.723121	0.043855	0.659056	0.047701	0.588329	0.050005
0.779464	0.039001	0.721929	0.043942	0.657733	0.047762	0.586876	0.050032
0.778400	0.039106	0.720734	0.044030	0.656408	0.047823	0.585420	0.050058
0.777333	0.039210	0.719537	0.044116	0.655080	0.047883	0.583962	0.050084
0.776264	0.039315	0.718337	0.044202	0.653750	0.047943	0.582501	0.050108
0.775192	0.039419	0.717135	0.044288	0.652417	0.048002	0.581037	0.050132
0.774118	0.039523	0.715930	0.044374	0.651081	0.048060	0.579571	0.050155
0.773041	0.039626	0.714722	0.044458	0.649743	0.048118	0.578102	0.050178
0.771961	0.039730	0.713512	0.044543	0.648402	0.048175	0.576631	0.050199
0.770879	0.039833	0.712300	0.044627	0.647059	0.048232	0.575157	0.050220
0.769795	0.039935	0.711084	0.044710	0.645713	0.048288	0.573680	0.050240
0.768707	0.040038	0.709867	0.044793	0.644365	0.048343	0.572201	0.050259
0.767618	0.040140	0.708646	0.044876	0.643014	0.048397	0.570720	0.050278
0.766525	0.040242	0.707423	0.044958	0.641660	0.048452	0.569236	0.050295
0.765431	0.040343	0.706198	0.045040	0.640304	0.048505	0.567749	0.050312
0.764333	0.040445	0.704970	0.045121	0.638946	0.048558	0.566260	0.050328
0.763233	0.040545	0.703739	0.045202	0.637584	0.048610	0.564768	0.050343
0.762131	0.040646	0.702506	0.045282	0.636221	0.048661	0.563274	0.050358
0.761026	0.040746	0.701271	0.045362	0.634854	0.048712	0.561777	0.050371
0.759918	0.040846	0.700032	0.045441	0.633485	0.048762	0.560277	0.050384
0.758808	0.040946	0.698792	0.045520	0.632114	0.048812	0.558775	0.050396
0.757695	0.041045	0.697548	0.045598	0.630740	0.048861	0.557271	0.050407
0.756580	0.041144	0.696302	0.045676	0.629363	0.048909	0.555763	0.050417
0.755462	0.041243	0.695054	0.045753	0.627984	0.048956	0.554254	0.050427
0.754341	0.041341	0.693803	0.045830	0.626603	0.049003	0.552741	0.050436
0.753218	0.041439	0.692549	0.045906	0.625218	0.049049	0.551227	0.050443
0.752093	0.041536	0.691293	0.045982	0.623832	0.049095	0.549709	0.050450
0.750965	0.041634	0.690034	0.046057	0.622442	0.049140	0.548189	0.050457
0.749834	0.041731	0.688773	0.046132	0.621050	0.049184	0.546667	0.050462
0.748701	0.041827	0.687509	0.046206	0.619656	0.049228	0.545142	0.050466
0.747565	0.041923	0.686243	0.046280	0.618259	0.049270	0.543614	0.050470
0.746427	0.042019	0.684974	0.046353	0.616859	0.049312	0.542084	0.050473
0.745286	0.042115	0.683702	0.046425	0.615457	0.049354	0.540551	0.050475
0.744142	0.042210	0.682428	0.046497	0.614052	0.049395	0.539016	0.050476
0.742996	0.042304	0.681151	0.046569	0.612645	0.049435	0.537478	0.050476
0.741847	0.042399	0.679872	0.046640	0.611235	0.049474	0.535937	0.050475
0.740696	0.042493	0.678590	0.046711	0.609823	0.049513	0.534394	0.050474
0.739543	0.042586	0.677306	0.046781	0.608408	0.049551	0.532849	0.050472
0.738386	0.042680	0.676019	0.046850	0.606990	0.049588	0.531301	0.050468
0.737227	0.042772	0.674729	0.046919	0.605570	0.049624	0.529750	0.050464
0.736066	0.042865	0.673437	0.046987	0.604148	0.049660	0.528197	0.050459

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.526641	0.050453	0.446880	0.049011	0.373052	0.045768	0.305884	0.041321
0.525082	0.050447	0.445369	0.048963	0.371671	0.045691	0.304634	0.041225
0.523521	0.050439	0.443860	0.048913	0.370292	0.045613	0.303386	0.041129
0.521958	0.050430	0.442353	0.048864	0.368916	0.045535	0.302141	0.041033
0.520392	0.050421	0.440849	0.048813	0.367543	0.045456	0.300898	0.040936
0.518823	0.050411	0.439348	0.048762	0.366172	0.045377	0.299658	0.040839
0.517252	0.050399	0.437849	0.048710	0.364804	0.045297	0.298420	0.040742
0.515678	0.050387	0.436353	0.048658	0.363438	0.045217	0.297185	0.040645
0.514102	0.050374	0.434859	0.048605	0.362075	0.045137	0.295953	0.040547
0.512523	0.050360	0.433368	0.048551	0.360715	0.045056	0.294723	0.040449
0.510942	0.050346	0.431879	0.048497	0.359357	0.044974	0.293495	0.040351
0.509358	0.050330	0.430393	0.048441	0.358001	0.044893	0.292271	0.040253
0.507771	0.050313	0.428910	0.048386	0.356648	0.044810	0.291048	0.040154
0.506182	0.050295	0.427429	0.048330	0.355298	0.044728	0.289829	0.040055
0.504590	0.050277	0.425950	0.048273	0.353950	0.044645	0.288612	0.039956
0.502996	0.050257	0.424474	0.048215	0.352605	0.044562	0.287397	0.039857
0.501399	0.050237	0.423001	0.048157	0.351262	0.044478	0.286185	0.039758
0.499800	0.050216	0.421531	0.048098	0.349922	0.044394	0.284975	0.039658
0.498201	0.050194	0.420062	0.048039	0.348585	0.044309	0.283769	0.039558
0.496605	0.050171	0.418597	0.047979	0.347250	0.044224	0.282564	0.039458
0.495012	0.050147	0.417134	0.047918	0.345918	0.044139	0.281363	0.039358
0.493420	0.050122	0.415674	0.047857	0.344588	0.044053	0.280163	0.039257
0.491832	0.050096	0.414216	0.047795	0.343261	0.043967	0.278967	0.039156
0.490246	0.050070	0.412760	0.047733	0.341936	0.043880	0.277773	0.039055
0.488663	0.050043	0.411308	0.047670	0.340614	0.043793	0.276581	0.038954
0.487082	0.050014	0.409857	0.047606	0.339294	0.043706	0.275392	0.038853
0.485504	0.049985	0.408410	0.047542	0.337977	0.043619	0.274206	0.038751
0.483928	0.049956	0.406965	0.047478	0.336663	0.043531	0.273022	0.038649
0.482355	0.049925	0.405522	0.047413	0.335351	0.043442	0.271841	0.038548
0.480784	0.049894	0.404082	0.047347	0.334042	0.043354	0.270662	0.038445
0.479216	0.049862	0.402645	0.047281	0.332735	0.043265	0.269486	0.038343
0.477651	0.049829	0.401210	0.047214	0.331431	0.043175	0.268312	0.038241
0.476088	0.049795	0.399778	0.047146	0.330129	0.043085	0.267141	0.038138
0.474528	0.049760	0.398348	0.047078	0.328830	0.042995	0.265973	0.038035
0.472970	0.049725	0.396921	0.047010	0.327533	0.042905	0.264807	0.037932
0.471415	0.049689	0.395497	0.046941	0.326239	0.042814	0.263643	0.037829
0.469862	0.049652	0.394074	0.046871	0.324948	0.042723	0.262483	0.037726
0.468312	0.049615	0.392655	0.046801	0.323659	0.042632	0.261324	0.037622
0.466765	0.049576	0.391238	0.046731	0.322373	0.042540	0.260169	0.037519
0.465220	0.049537	0.389824	0.046660	0.321089	0.042448	0.259016	0.037415
0.463677	0.049497	0.388412	0.046588	0.319808	0.042356	0.257865	0.037311
0.462138	0.049457	0.387003	0.046516	0.318529	0.042263	0.256717	0.037207
0.460600	0.049415	0.385596	0.046443	0.317253	0.042170	0.255572	0.037103
0.459066	0.049373	0.384192	0.046370	0.315980	0.042077	0.254429	0.036998
0.457533	0.049330	0.382791	0.046297	0.314709	0.041984	0.253289	0.036894
0.456004	0.049287	0.381392	0.046223	0.313441	0.041890	0.252151	0.036789
0.454477	0.049243	0.379995	0.046148	0.312175	0.041796	0.251016	0.036684
0.452952	0.049198	0.378601	0.046073	0.310912	0.041701	0.249883	0.036579
0.451431	0.049152	0.377210	0.045998	0.309651	0.041607	0.248753	0.036474
0.449911	0.049106	0.375821	0.045922	0.308393	0.041512	0.247626	0.036369
0.448394	0.049059	0.374435	0.045845	0.307137	0.041416	0.246501	0.036264

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.245378	0.036158	0.191657	0.030693	0.144457	0.024961	0.103918	0.019233
0.244258	0.036053	0.190668	0.030583	0.143598	0.024848	0.103190	0.019124
0.243141	0.035947	0.189681	0.030473	0.142742	0.024734	0.102464	0.019014
0.242026	0.035842	0.188696	0.030363	0.141888	0.024620	0.101741	0.018905
0.240914	0.035736	0.187714	0.030253	0.141037	0.024506	0.101021	0.018796
0.239805	0.035630	0.186735	0.030143	0.140188	0.024393	0.100303	0.018687
0.238698	0.035524	0.185758	0.030032	0.139342	0.024279	0.099587	0.018578
0.237593	0.035417	0.184784	0.029921	0.138499	0.024166	0.098874	0.018469
0.236491	0.035311	0.183813	0.029811	0.137658	0.024052	0.098164	0.018360
0.235392	0.035205	0.182844	0.029700	0.136819	0.023939	0.097456	0.018252
0.234295	0.035098	0.181877	0.029589	0.135983	0.023825	0.096751	0.018144
0.233201	0.034992	0.180913	0.029477	0.135150	0.023712	0.096048	0.018036
0.232110	0.034885	0.179952	0.029366	0.134319	0.023598	0.095348	0.017928
0.231020	0.034778	0.178993	0.029255	0.133491	0.023485	0.094650	0.017820
0.229934	0.034672	0.178037	0.029143	0.132666	0.023371	0.093955	0.017713
0.228850	0.034565	0.177083	0.029032	0.131843	0.023258	0.093263	0.017605
0.227769	0.034458	0.176132	0.028920	0.131022	0.023145	0.092573	0.017498
0.226690	0.034351	0.175184	0.028808	0.130204	0.023032	0.091886	0.017391
0.225614	0.034244	0.174238	0.028696	0.129389	0.022918	0.091201	0.017285
0.224540	0.034137	0.173294	0.028584	0.128576	0.022805	0.090519	0.017178
0.223469	0.034029	0.172353	0.028472	0.127766	0.022692	0.089839	0.017072
0.222400	0.033922	0.171415	0.028359	0.126958	0.022579	0.089162	0.016966
0.221334	0.033815	0.170479	0.028247	0.126153	0.022466	0.088488	0.016860
0.220271	0.033707	0.169546	0.028134	0.125350	0.022353	0.087816	0.016754
0.219210	0.033600	0.168616	0.028022	0.124550	0.022241	0.087146	0.016648
0.218151	0.033492	0.167688	0.027909	0.123753	0.022128	0.086479	0.016543
0.217096	0.033385	0.166762	0.027796	0.122958	0.022015	0.085815	0.016438
0.216042	0.033277	0.165839	0.027683	0.122166	0.021903	0.085153	0.016333
0.214992	0.033169	0.164919	0.027571	0.121376	0.021790	0.084494	0.016228
0.213944	0.033062	0.164001	0.027458	0.120589	0.021678	0.083838	0.016124
0.212898	0.032954	0.163086	0.027345	0.119804	0.021566	0.083184	0.016019
0.211855	0.032846	0.162173	0.027231	0.119022	0.021454	0.082532	0.015915
0.210815	0.032738	0.161263	0.027118	0.118243	0.021341	0.081883	0.015811
0.209777	0.032630	0.160355	0.027005	0.117466	0.021229	0.081237	0.015708
0.208741	0.032522	0.159450	0.026892	0.116691	0.021118	0.080593	0.015604
0.207709	0.032414	0.158548	0.026779	0.115919	0.021006	0.079952	0.015501
0.206679	0.032307	0.157648	0.026665	0.115150	0.020894	0.079313	0.015398
0.205651	0.032199	0.156751	0.026552	0.114383	0.020782	0.078677	0.015296
0.204626	0.032091	0.155856	0.026438	0.113619	0.020671	0.078044	0.015193
0.203603	0.031982	0.154964	0.026325	0.112858	0.020560	0.077413	0.015091
0.202584	0.031874	0.154074	0.026211	0.112099	0.020448	0.076784	0.014989
0.201566	0.031766	0.153187	0.026098	0.111342	0.020337	0.076158	0.014887
0.200551	0.031658	0.152303	0.025984	0.110588	0.020226	0.075535	0.014786
0.199665	0.031564	0.151421	0.025871	0.109837	0.020115	0.074914	0.014684
0.198655	0.031456	0.150541	0.025757	0.109088	0.020005	0.074296	0.014583
0.197648	0.031347	0.149664	0.025643	0.108342	0.019894	0.073681	0.014483
0.196643	0.031238	0.148790	0.025530	0.107598	0.019784	0.073068	0.014382
0.195641	0.031130	0.147918	0.025416	0.106857	0.019673	0.072457	0.014282
0.194641	0.031021	0.147049	0.025302	0.106119	0.019563	0.071849	0.014182
0.193644	0.030911	0.146183	0.025189	0.105383	0.019453	0.071244	0.014082
0.192649	0.030802	0.145319	0.025075	0.104649	0.019343	0.070641	0.013983

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.070041	0.013883	0.042825	0.009218	0.022269	0.005480	0.008376	0.002849
0.069443	0.013784	0.042357	0.009136	0.021933	0.005417	0.008170	0.002810
0.068848	0.013686	0.041893	0.009053	0.021599	0.005355	0.007966	0.002770
0.068255	0.013587	0.041431	0.008971	0.021268	0.005293	0.007766	0.002732
0.067665	0.013489	0.040972	0.008889	0.020939	0.005232	0.007568	0.002694
0.067078	0.013391	0.040515	0.008808	0.020613	0.005171	0.007372	0.002656
0.066493	0.013294	0.040061	0.008726	0.020289	0.005110	0.007179	0.002619
0.065911	0.013197	0.039609	0.008646	0.019968	0.005050	0.006988	0.002582
0.065331	0.013099	0.039160	0.008565	0.019649	0.004990	0.006800	0.002546
0.064754	0.013003	0.038713	0.008485	0.019334	0.004931	0.006615	0.002510
0.064179	0.012906	0.038269	0.008406	0.019020	0.004872	0.006432	0.002475
0.063607	0.012810	0.037828	0.008327	0.018709	0.004814	0.006252	0.002440
0.063038	0.012714	0.037389	0.008248	0.018401	0.004756	0.006074	0.002405
0.062471	0.012619	0.036952	0.008169	0.018095	0.004699	0.005899	0.002372
0.061906	0.012523	0.036519	0.008091	0.017792	0.004641	0.005727	0.002338
0.061345	0.012428	0.036087	0.008013	0.017491	0.004585	0.005557	0.002305
0.060785	0.012334	0.035659	0.007936	0.017193	0.004529	0.005389	0.002273
0.060229	0.012239	0.035233	0.007859	0.016898	0.004473	0.005225	0.002241
0.059674	0.012145	0.034809	0.007783	0.016605	0.004418	0.005062	0.002209
0.059123	0.012051	0.034388	0.007706	0.016315	0.004363	0.004922	0.002182
0.058574	0.011958	0.033970	0.007631	0.016027	0.004308	0.004765	0.002152
0.058027	0.011864	0.033554	0.007555	0.015742	0.004254	0.004610	0.002122
0.057483	0.011771	0.033141	0.007480	0.015459	0.004201	0.004457	0.002092
0.056942	0.011679	0.032730	0.007406	0.015179	0.004148	0.004308	0.002063
0.056403	0.011587	0.032322	0.007331	0.014901	0.004095	0.004160	0.002034
0.055867	0.011495	0.031916	0.007257	0.014626	0.004043	0.004016	0.002006
0.055334	0.011403	0.031513	0.007184	0.014354	0.003992	0.003874	0.001979
0.054802	0.011312	0.031113	0.007111	0.014084	0.003940	0.003734	0.001952
0.054274	0.011221	0.030715	0.007038	0.013817	0.003890	0.003597	0.001925
0.053748	0.011130	0.030319	0.006966	0.013552	0.003839	0.003463	0.001899
0.053225	0.011039	0.029927	0.006894	0.013290	0.003789	0.003331	0.001873
0.052704	0.010949	0.029536	0.006823	0.013030	0.003740	0.003201	0.001848
0.052185	0.010860	0.029149	0.006752	0.012773	0.003691	0.003075	0.001823
0.051670	0.010770	0.028764	0.006681	0.012519	0.003642	0.002950	0.001799
0.051156	0.010681	0.028381	0.006611	0.012267	0.003594	0.002829	0.001775
0.050646	0.010592	0.028001	0.006541	0.012017	0.003547	0.002710	0.001752
0.050138	0.010504	0.027624	0.006472	0.011770	0.003500	0.002593	0.001730
0.049632	0.010416	0.027249	0.006403	0.011526	0.003453	0.002479	0.001707
0.049129	0.010328	0.026876	0.006334	0.011285	0.003407	0.002368	0.001686
0.048629	0.010241	0.026507	0.006266	0.011045	0.003361	0.002259	0.001664
0.048131	0.010154	0.026139	0.006198	0.010809	0.003316	0.002153	0.001644
0.047636	0.010067	0.025775	0.006131	0.010575	0.003271	0.002049	0.001623
0.047143	0.009980	0.025413	0.006064	0.010343	0.003227	0.001948	0.001604
0.046653	0.009894	0.025053	0.005997	0.010114	0.003183	0.001849	0.001584
0.046166	0.009809	0.024696	0.005931	0.009888	0.003140	0.001753	0.001566
0.045681	0.009723	0.024342	0.005865	0.009664	0.003097	0.001660	0.001547
0.045198	0.009638	0.023990	0.005800	0.009443	0.003054	0.001569	0.001530
0.044718	0.009554	0.023641	0.005735	0.009225	0.003012	0.001480	0.001512
0.044241	0.009469	0.023294	0.005671	0.009008	0.002971	0.001394	0.001496
0.043766	0.009385	0.022950	0.005607	0.008795	0.002930	0.001311	0.001479
0.043294	0.009302	0.022608	0.005543	0.008584	0.002889	0.001231	0.001464

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.001152	0.001446	0.000558	-0.000964	0.006592	-0.000433	0.019294	0.001084
0.001077	0.001425	0.000613	-0.000990	0.006777	-0.000411	0.019610	0.001121
0.001004	0.001400	0.000670	-0.001014	0.006965	-0.000388	0.019928	0.001159
0.000933	0.001372	0.000730	-0.001034	0.007155	-0.000365	0.020249	0.001197
0.000866	0.001341	0.000792	-0.001052	0.007348	-0.000342	0.020572	0.001236
0.000800	0.001306	0.000857	-0.001066	0.007543	-0.000319	0.020898	0.001274
0.000738	0.001269	0.000925	-0.001076	0.007741	-0.000295	0.021226	0.001314
0.000677	0.001230	0.000995	-0.001083	0.007941	-0.000271	0.021558	0.001353
0.000620	0.001189	0.001068	-0.001085	0.008144	-0.000247	0.021891	0.001393
0.000565	0.001145	0.001143	-0.001083	0.008350	-0.000223	0.022227	0.001433
0.000512	0.001100	0.001221	-0.001076	0.008558	-0.000198	0.022566	0.001473
0.000462	0.001053	0.001301	-0.001067	0.008768	-0.000173	0.022907	0.001513
0.000415	0.001005	0.001384	-0.001057	0.008982	-0.000147	0.023251	0.001554
0.000370	0.000955	0.001469	-0.001047	0.009197	-0.000121	0.023597	0.001596
0.000328	0.000903	0.001557	-0.001036	0.009416	-0.000095	0.023946	0.001637
0.000288	0.000851	0.001648	-0.001025	0.009637	-0.000069	0.024298	0.001679
0.000251	0.000798	0.001741	-0.001014	0.009860	-0.000042	0.024652	0.001721
0.000216	0.000743	0.001837	-0.001002	0.010086	-0.000015	0.025008	0.001763
0.000184	0.000688	0.001935	-0.000991	0.010315	0.000012	0.025368	0.001806
0.000155	0.000632	0.002036	-0.000979	0.010546	0.000040	0.025729	0.001849
0.000128	0.000576	0.002139	-0.000966	0.010779	0.000068	0.026094	0.001892
0.000104	0.000519	0.002245	-0.000954	0.011016	0.000096	0.026461	0.001936
0.000082	0.000462	0.002354	-0.000940	0.011255	0.000125	0.026830	0.001980
0.000063	0.000404	0.002465	-0.000927	0.011496	0.000153	0.027202	0.002024
0.000046	0.000346	0.002579	-0.000914	0.011740	0.000183	0.027577	0.002068
0.000032	0.000288	0.002695	-0.000900	0.011986	0.000212	0.027954	0.002113
0.000020	0.000230	0.002814	-0.000885	0.012235	0.000242	0.028333	0.002158
0.000012	0.000173	0.002935	-0.000871	0.012487	0.000272	0.028716	0.002203
0.000005	0.000115	0.003059	-0.000856	0.012741	0.000302	0.029100	0.002249
0.000001	0.000057	0.003185	-0.000841	0.012998	0.000333	0.029488	0.002295
0.000000	0.000000	0.003314	-0.000825	0.013257	0.000364	0.029878	0.002341
0.000001	-0.000050	0.003446	-0.000810	0.013519	0.000395	0.030270	0.002388
0.000005	-0.000106	0.003580	-0.000794	0.013784	0.000427	0.030665	0.002434
0.000011	-0.000162	0.003717	-0.000777	0.014050	0.000458	0.031063	0.002482
0.000019	-0.000217	0.003856	-0.000760	0.014320	0.000491	0.031463	0.002529
0.000030	-0.000272	0.003998	-0.000743	0.014592	0.000523	0.031866	0.002577
0.000044	-0.000325	0.004142	-0.000726	0.014867	0.000556	0.032271	0.002625
0.000061	-0.000378	0.004289	-0.000709	0.015144	0.000589	0.032679	0.002673
0.000079	-0.000429	0.004439	-0.000691	0.015424	0.000622	0.033089	0.002722
0.000101	-0.000480	0.004591	-0.000672	0.015706	0.000656	0.033502	0.002770
0.000125	-0.000529	0.004745	-0.000654	0.015991	0.000690	0.033918	0.002820
0.000151	-0.000578	0.004902	-0.000635	0.016279	0.000724	0.034336	0.002869
0.000181	-0.000624	0.005042	-0.000618	0.016569	0.000759	0.034756	0.002919
0.000212	-0.000669	0.005204	-0.000599	0.016861	0.000794	0.035180	0.002969
0.000247	-0.000713	0.005369	-0.000579	0.017156	0.000829	0.035605	0.003019
0.000283	-0.000755	0.005536	-0.000559	0.017454	0.000864	0.036034	0.003070
0.000323	-0.000795	0.005705	-0.000539	0.017754	0.000900	0.036465	0.003121
0.000365	-0.000833	0.005878	-0.000518	0.018057	0.000936	0.036898	0.003172
0.000409	-0.000869	0.006052	-0.000497	0.018363	0.000973	0.037334	0.003224
0.000456	-0.000903	0.006230	-0.000476	0.018671	0.001009	0.037773	0.003275
0.000506	-0.000934	0.006410	-0.000455	0.018981	0.001046	0.038214	0.003328

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.038657	0.003380	0.064682	0.006435	0.097368	0.010216	0.136715	0.014674
0.039104	0.003433	0.065259	0.006502	0.098075	0.010297	0.137553	0.014768
0.039553	0.003486	0.065838	0.006570	0.098785	0.010378	0.138393	0.014862
0.040004	0.003539	0.066420	0.006638	0.099498	0.010460	0.139237	0.014956
0.040458	0.003593	0.067005	0.006706	0.100213	0.010542	0.140082	0.015051
0.040914	0.003646	0.067592	0.006774	0.100931	0.010624	0.140931	0.015146
0.041373	0.003701	0.068182	0.006843	0.101651	0.010706	0.141782	0.015240
0.041835	0.003755	0.068774	0.006912	0.102374	0.010789	0.142635	0.015336
0.042299	0.003810	0.069369	0.006981	0.103099	0.010872	0.143491	0.015431
0.042766	0.003865	0.069966	0.007051	0.103827	0.010955	0.144350	0.015527
0.043235	0.003920	0.070566	0.007120	0.104558	0.011039	0.145211	0.015623
0.043707	0.003976	0.071168	0.007190	0.105291	0.011122	0.146075	0.015719
0.044182	0.004032	0.071773	0.007261	0.106026	0.011206	0.146941	0.015815
0.044659	0.004088	0.072381	0.007331	0.106765	0.011290	0.147810	0.015911
0.045138	0.004144	0.072991	0.007402	0.107505	0.011375	0.148681	0.016008
0.045620	0.004201	0.073604	0.007474	0.108249	0.011459	0.149555	0.016105
0.046105	0.004258	0.074219	0.007545	0.108995	0.011544	0.150431	0.016202
0.046592	0.004315	0.074837	0.007617	0.109743	0.011630	0.151311	0.016300
0.047082	0.004373	0.075457	0.007689	0.110494	0.011715	0.152192	0.016398
0.047574	0.004431	0.076080	0.007761	0.111248	0.011801	0.153076	0.016495
0.048069	0.004489	0.076706	0.007833	0.112004	0.011887	0.153963	0.016594
0.048567	0.004548	0.077334	0.007906	0.112763	0.011973	0.154852	0.016692
0.049067	0.004606	0.077965	0.007979	0.113524	0.012060	0.155744	0.016790
0.049569	0.004665	0.078598	0.008053	0.114288	0.012146	0.156639	0.016889
0.050075	0.004725	0.079234	0.008126	0.115054	0.012233	0.157536	0.016988
0.050582	0.004784	0.079872	0.008200	0.115823	0.012320	0.158435	0.017087
0.051093	0.004844	0.080513	0.008274	0.116595	0.012408	0.159337	0.017187
0.051605	0.004905	0.081156	0.008349	0.117369	0.012496	0.160242	0.017287
0.052121	0.004965	0.081802	0.008424	0.118145	0.012584	0.161149	0.017386
0.052639	0.005026	0.082451	0.008499	0.118924	0.012672	0.162059	0.017487
0.053159	0.005087	0.083102	0.008574	0.119706	0.012760	0.162972	0.017587
0.053682	0.005148	0.083756	0.008649	0.120491	0.012849	0.163886	0.017687
0.054208	0.005210	0.084412	0.008725	0.121277	0.012938	0.164804	0.017788
0.054736	0.005272	0.085071	0.008801	0.122067	0.013027	0.165724	0.017889
0.055267	0.005334	0.085732	0.008878	0.122859	0.013117	0.166647	0.017990
0.055800	0.005397	0.086396	0.008954	0.123653	0.013206	0.167572	0.018092
0.056336	0.005459	0.087063	0.009031	0.124450	0.013296	0.168499	0.018193
0.056875	0.005522	0.087732	0.009108	0.125250	0.013386	0.169430	0.018295
0.057416	0.005586	0.088403	0.009186	0.126052	0.013477	0.170363	0.018397
0.057959	0.005649	0.089078	0.009263	0.126857	0.013568	0.171298	0.018499
0.058505	0.005713	0.089754	0.009341	0.127665	0.013659	0.172236	0.018602
0.059054	0.005778	0.090434	0.009419	0.128475	0.013750	0.173177	0.018704
0.059605	0.005842	0.091116	0.009498	0.129287	0.013841	0.174120	0.018807
0.060159	0.005907	0.091800	0.009577	0.130102	0.013933	0.175065	0.018910
0.060716	0.005972	0.092487	0.009656	0.130920	0.014025	0.176014	0.019013
0.061275	0.006037	0.093177	0.009735	0.131740	0.014117	0.176964	0.019117
0.061836	0.006103	0.093869	0.009814	0.132563	0.014209	0.177918	0.019220
0.062400	0.006169	0.094563	0.009894	0.133388	0.014302	0.178874	0.019324
0.062967	0.006235	0.095261	0.009974	0.134216	0.014394	0.179832	0.019428
0.063536	0.006301	0.095960	0.010054	0.135046	0.014488	0.180793	0.019532
0.064108	0.006368	0.096663	0.010135	0.135879	0.014581	0.181757	0.019637

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.182723	0.019742	0.235255	0.025192	0.294569	0.030437	0.360545	0.035046
0.183691	0.019846	0.236354	0.025298	0.295799	0.030535	0.361905	0.035127
0.184663	0.019951	0.237455	0.025404	0.297031	0.030633	0.363268	0.035207
0.185637	0.020057	0.238560	0.025510	0.298266	0.030730	0.364633	0.035287
0.186613	0.020162	0.239666	0.025616	0.299503	0.030827	0.366001	0.035367
0.187592	0.020268	0.240776	0.025722	0.300743	0.030924	0.367371	0.035446
0.188573	0.020374	0.241887	0.025828	0.301985	0.031021	0.368744	0.035525
0.189557	0.020480	0.243002	0.025934	0.303230	0.031117	0.370120	0.035603
0.190544	0.020586	0.244119	0.026040	0.304478	0.031213	0.371498	0.035681
0.191533	0.020692	0.245238	0.026145	0.305728	0.031309	0.372879	0.035759
0.192525	0.020799	0.246360	0.026251	0.306981	0.031405	0.374262	0.035836
0.193519	0.020906	0.247485	0.026356	0.308236	0.031500	0.375648	0.035912
0.194516	0.021013	0.248612	0.026461	0.309494	0.031595	0.377036	0.035988
0.195516	0.021120	0.249742	0.026566	0.310754	0.031690	0.378427	0.036064
0.196518	0.021227	0.250874	0.026671	0.312017	0.031784	0.379821	0.036139
0.197522	0.021335	0.252009	0.026776	0.313282	0.031878	0.381217	0.036213
0.198529	0.021442	0.253146	0.026881	0.314550	0.031972	0.382616	0.036287
0.199539	0.021550	0.254286	0.026985	0.315821	0.032066	0.384017	0.036361
0.200425	0.021645	0.255429	0.027090	0.317094	0.032159	0.385421	0.036434
0.201439	0.021753	0.256574	0.027194	0.318370	0.032252	0.386827	0.036507
0.202456	0.021861	0.257721	0.027298	0.319648	0.032344	0.388236	0.036579
0.203476	0.021969	0.258872	0.027402	0.320929	0.032437	0.389647	0.036651
0.204498	0.022077	0.260024	0.027506	0.322212	0.032529	0.391061	0.036722
0.205523	0.022185	0.261180	0.027609	0.323498	0.032621	0.392478	0.036793
0.206550	0.022293	0.262338	0.027713	0.324787	0.032712	0.393897	0.036863
0.207580	0.022401	0.263498	0.027816	0.326078	0.032803	0.395319	0.036932
0.208612	0.022509	0.264661	0.027919	0.327371	0.032894	0.396743	0.037001
0.209647	0.022617	0.265827	0.028022	0.328668	0.032984	0.398170	0.037070
0.210685	0.022725	0.266995	0.028125	0.329966	0.033074	0.399599	0.037138
0.211725	0.022833	0.268166	0.028228	0.331268	0.033164	0.401031	0.037205
0.212768	0.022940	0.269339	0.028330	0.332572	0.033253	0.402465	0.037272
0.213813	0.023048	0.270515	0.028433	0.333878	0.033342	0.403903	0.037339
0.214861	0.023156	0.271693	0.028535	0.335187	0.033431	0.405342	0.037404
0.215911	0.023264	0.272874	0.028637	0.336499	0.033520	0.406784	0.037470
0.216964	0.023371	0.274058	0.028738	0.337813	0.033608	0.408229	0.037534
0.218019	0.023479	0.275244	0.028840	0.339129	0.033695	0.409676	0.037598
0.219077	0.023586	0.276432	0.028941	0.340449	0.033782	0.411126	0.037662
0.220138	0.023694	0.277624	0.029043	0.341770	0.033869	0.412579	0.037725
0.221201	0.023801	0.278817	0.029144	0.343095	0.033956	0.414034	0.037787
0.222267	0.023909	0.280014	0.029244	0.344422	0.034042	0.415491	0.037849
0.223335	0.024016	0.281212	0.029345	0.345751	0.034128	0.416951	0.037911
0.224406	0.024123	0.282414	0.029445	0.347083	0.034213	0.418414	0.037971
0.225479	0.024230	0.283618	0.029546	0.348418	0.034298	0.419879	0.038031
0.226555	0.024337	0.284824	0.029646	0.349755	0.034383	0.421347	0.038091
0.227634	0.024444	0.286034	0.029745	0.351095	0.034467	0.422817	0.038150
0.228715	0.024551	0.287245	0.029845	0.352437	0.034551	0.424290	0.038208
0.229798	0.024658	0.288460	0.029944	0.353782	0.034634	0.425766	0.038265
0.230885	0.024765	0.289676	0.030043	0.355129	0.034718	0.427244	0.038322
0.231973	0.024872	0.290896	0.030142	0.356479	0.034800	0.428724	0.038379
0.233065	0.024979	0.292118	0.030241	0.357832	0.034882	0.430207	0.038435
0.234158	0.025085	0.293342	0.030339	0.359187	0.034964	0.431693	0.038490

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.433181	0.038544	0.512326	0.040359	0.589599	0.039981	0.660211	0.037647
0.434672	0.038598	0.513905	0.040373	0.591048	0.039953	0.661529	0.037584
0.436166	0.038651	0.515481	0.040386	0.592494	0.039924	0.662845	0.037521
0.437662	0.038704	0.517055	0.040398	0.593937	0.039894	0.664157	0.037457
0.439160	0.038756	0.518627	0.040409	0.595378	0.039863	0.665468	0.037393
0.440661	0.038807	0.520196	0.040420	0.596816	0.039832	0.666776	0.037328
0.442165	0.038857	0.521762	0.040429	0.598252	0.039800	0.668081	0.037263
0.443671	0.038907	0.523326	0.040438	0.599685	0.039767	0.669383	0.037197
0.445180	0.038956	0.524887	0.040446	0.601116	0.039734	0.670683	0.037130
0.446691	0.039005	0.526446	0.040453	0.602544	0.039699	0.671981	0.037063
0.448205	0.039053	0.528002	0.040459	0.603970	0.039664	0.673276	0.036996
0.449721	0.039100	0.529556	0.040464	0.605393	0.039629	0.674568	0.036927
0.451240	0.039146	0.531107	0.040468	0.606813	0.039592	0.675858	0.036859
0.452762	0.039192	0.532655	0.040471	0.608231	0.039555	0.677145	0.036789
0.454286	0.039237	0.534201	0.040474	0.609646	0.039517	0.678430	0.036719
0.455813	0.039281	0.535745	0.040475	0.611059	0.039479	0.679712	0.036649
0.457342	0.039325	0.537285	0.040476	0.612469	0.039440	0.680991	0.036578
0.458874	0.039368	0.538824	0.040476	0.613877	0.039400	0.682268	0.036506
0.460408	0.039410	0.540359	0.040475	0.615282	0.039359	0.683543	0.036434
0.461945	0.039452	0.541892	0.040473	0.616684	0.039318	0.684815	0.036362
0.463485	0.039492	0.543423	0.040470	0.618084	0.039276	0.686084	0.036289
0.465027	0.039532	0.544951	0.040467	0.619481	0.039233	0.687351	0.036215
0.466571	0.039571	0.546476	0.040463	0.620876	0.039190	0.688615	0.036141
0.468119	0.039610	0.547999	0.040457	0.622268	0.039145	0.689877	0.036066
0.469668	0.039648	0.549519	0.040451	0.623658	0.039101	0.691136	0.035991
0.471221	0.039685	0.551037	0.040444	0.625045	0.039055	0.692392	0.035915
0.472776	0.039721	0.552552	0.040437	0.626430	0.039009	0.693646	0.035839
0.474333	0.039756	0.554065	0.040428	0.627812	0.038962	0.694897	0.035763
0.475893	0.039791	0.555575	0.040419	0.629191	0.038915	0.696146	0.035685
0.477455	0.039825	0.557082	0.040408	0.630568	0.038867	0.697393	0.035608
0.479021	0.039858	0.558587	0.040397	0.631942	0.038818	0.698636	0.035529
0.480588	0.039890	0.560090	0.040386	0.633314	0.038768	0.699877	0.035451
0.482158	0.039921	0.561589	0.040373	0.634683	0.038718	0.701116	0.035371
0.483731	0.039952	0.563087	0.040359	0.636050	0.038668	0.702352	0.035292
0.485307	0.039982	0.564581	0.040345	0.637414	0.038616	0.703585	0.035212
0.486885	0.040011	0.566073	0.040330	0.638776	0.038564	0.704816	0.035131
0.488465	0.040039	0.567563	0.040314	0.640134	0.038512	0.706045	0.035050
0.490048	0.040066	0.569050	0.040297	0.641491	0.038458	0.707270	0.034968
0.491634	0.040093	0.570534	0.040280	0.642845	0.038404	0.708494	0.034886
0.493222	0.040119	0.572016	0.040262	0.644196	0.038350	0.709714	0.034804
0.494812	0.040144	0.573496	0.040242	0.645545	0.038294	0.710932	0.034721
0.496406	0.040168	0.574972	0.040223	0.646891	0.038239	0.712148	0.034637
0.498002	0.040191	0.576447	0.040202	0.648234	0.038182	0.713361	0.034553
0.499600	0.040213	0.577918	0.040180	0.649575	0.038125	0.714571	0.034469
0.501200	0.040234	0.579387	0.040158	0.650914	0.038067	0.715779	0.034384
0.502797	0.040255	0.580854	0.040135	0.652250	0.038009	0.716984	0.034299
0.504391	0.040275	0.582318	0.040111	0.653583	0.037950	0.718187	0.034213
0.505983	0.040293	0.583779	0.040087	0.654914	0.037891	0.719387	0.034127
0.507573	0.040311	0.585238	0.040062	0.656242	0.037831	0.720585	0.034040
0.509160	0.040328	0.586694	0.040036	0.657568	0.037770	0.721780	0.033953
0.510744	0.040344	0.588148	0.040009	0.658891	0.037709	0.722972	0.033866

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.724162	0.033778	0.781452	0.028803	0.832081	0.023242	0.876048	0.017762
0.725350	0.033690	0.782509	0.028697	0.833007	0.023133	0.876844	0.017657
0.726534	0.033601	0.783563	0.028591	0.833930	0.023024	0.877636	0.017553
0.727717	0.033512	0.784615	0.028485	0.834851	0.022915	0.878427	0.017448
0.728896	0.033422	0.785664	0.028379	0.835770	0.022806	0.879215	0.017344
0.730073	0.033332	0.786710	0.028272	0.836686	0.022696	0.880000	0.017240
0.731248	0.033242	0.787754	0.028165	0.837599	0.022587	0.880783	0.017136
0.732420	0.033151	0.788796	0.028058	0.838510	0.022478	0.881563	0.017032
0.733589	0.033060	0.789834	0.027950	0.839418	0.022369	0.882340	0.016928
0.734756	0.032968	0.790871	0.027842	0.840324	0.022261	0.883115	0.016824
0.735921	0.032876	0.791904	0.027734	0.841227	0.022152	0.883888	0.016721
0.737082	0.032784	0.792935	0.027626	0.842127	0.022043	0.884658	0.016617
0.738242	0.032691	0.793964	0.027518	0.843025	0.021934	0.885425	0.016514
0.739398	0.032598	0.794990	0.027409	0.843921	0.021826	0.886190	0.016411
0.740552	0.032504	0.796013	0.027300	0.844813	0.021717	0.886952	0.016308
0.741704	0.032411	0.797034	0.027191	0.845704	0.021609	0.887712	0.016205
0.742853	0.032316	0.798053	0.027082	0.846591	0.021500	0.888469	0.016103
0.743999	0.032222	0.799068	0.026973	0.847477	0.021392	0.889224	0.016000
0.745143	0.032127	0.800082	0.026863	0.848359	0.021284	0.889975	0.015898
0.746284	0.032031	0.801092	0.026753	0.849239	0.021175	0.890725	0.015796
0.747423	0.031935	0.802100	0.026643	0.850117	0.021067	0.891472	0.015694
0.748559	0.031839	0.803106	0.026533	0.850992	0.020959	0.892216	0.015592
0.749693	0.031743	0.804109	0.026424	0.851864	0.020851	0.892958	0.015490
0.750824	0.031646	0.805109	0.026314	0.852734	0.020743	0.893697	0.015389
0.751952	0.031549	0.806107	0.026204	0.853601	0.020635	0.894434	0.015288
0.753078	0.031451	0.807102	0.026094	0.854466	0.020528	0.895168	0.015187
0.754201	0.031353	0.808095	0.025984	0.855328	0.020420	0.895899	0.015086
0.755322	0.031255	0.809085	0.025874	0.856187	0.020313	0.896628	0.014985
0.756440	0.031156	0.810073	0.025765	0.857044	0.020205	0.897354	0.014884
0.757556	0.031057	0.811058	0.025655	0.857899	0.020098	0.898078	0.014784
0.758669	0.030958	0.812040	0.025545	0.858751	0.019990	0.898800	0.014684
0.759779	0.030859	0.813020	0.025435	0.859600	0.019883	0.899518	0.014583
0.760887	0.030759	0.813998	0.025325	0.860447	0.019776	0.900234	0.014484
0.761993	0.030659	0.814972	0.025215	0.861291	0.019669	0.900948	0.014384
0.763096	0.030558	0.815945	0.025106	0.862132	0.019562	0.901659	0.014284
0.764196	0.030457	0.816914	0.024996	0.862971	0.019455	0.902367	0.014185
0.765294	0.030356	0.817881	0.024886	0.863808	0.019349	0.903073	0.014086
0.766389	0.030254	0.818846	0.024776	0.864642	0.019242	0.903777	0.013987
0.767481	0.030153	0.819808	0.024666	0.865473	0.019136	0.904477	0.013888
0.768571	0.030051	0.820767	0.024557	0.866302	0.019029	0.905175	0.013790
0.769659	0.029948	0.821724	0.024447	0.867128	0.018923	0.905871	0.013691
0.770744	0.029846	0.822678	0.024337	0.867952	0.018817	0.906564	0.013593
0.771826	0.029743	0.823630	0.024228	0.868773	0.018711	0.907255	0.013495
0.772906	0.029639	0.824579	0.024118	0.869592	0.018605	0.907943	0.013398
0.773983	0.029536	0.825526	0.024009	0.870408	0.018499	0.908628	0.013300
0.775058	0.029432	0.826470	0.023899	0.871221	0.018394	0.909311	0.013203
0.776130	0.029328	0.827412	0.023790	0.872032	0.018288	0.909991	0.013106
0.777200	0.029223	0.828351	0.023680	0.872840	0.018183	0.910669	0.013009
0.778266	0.029119	0.829287	0.023571	0.873646	0.018077	0.911344	0.012912
0.779331	0.029014	0.830221	0.023461	0.874449	0.017972	0.912017	0.012815
0.780393	0.028909	0.831152	0.023352	0.875250	0.017867	0.912687	0.012719

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.913354	0.012623	0.943999	0.008043	0.967983	0.004222	0.985305	0.001326
0.914019	0.012527	0.944533	0.007961	0.968386	0.004156	0.985578	0.001280
0.914681	0.012432	0.945065	0.007878	0.968787	0.004090	0.985849	0.001234
0.915341	0.012336	0.945594	0.007796	0.969186	0.004024	0.986117	0.001188
0.915998	0.012241	0.946121	0.007714	0.969582	0.003959	0.986382	0.001142
0.916653	0.012146	0.946645	0.007632	0.969975	0.003895	0.986645	0.001098
0.917305	0.012051	0.947166	0.007551	0.970366	0.003830	0.986905	0.001053
0.917955	0.011957	0.947685	0.007470	0.970755	0.003766	0.987163	0.001009
0.918602	0.011862	0.948202	0.007389	0.971140	0.003703	0.987418	0.000965
0.919246	0.011768	0.948715	0.007309	0.971524	0.003639	0.987671	0.000922
0.919888	0.011674	0.949227	0.007229	0.971904	0.003576	0.987921	0.000879
0.920527	0.011581	0.949735	0.007149	0.972282	0.003514	0.988168	0.000837
0.921164	0.011487	0.950242	0.007069	0.972658	0.003452	0.988413	0.000794
0.921798	0.011394	0.950745	0.006990	0.973031	0.003390	0.988655	0.000753
0.922430	0.011301	0.951246	0.006911	0.973401	0.003328	0.988895	0.000712
0.923059	0.011209	0.951745	0.006833	0.973769	0.003267	0.989132	0.000671
0.923685	0.011116	0.952240	0.006754	0.974134	0.003207	0.989367	0.000630
0.924309	0.011024	0.952734	0.006676	0.974497	0.003146	0.989599	0.000591
0.924931	0.010932	0.953224	0.006599	0.974857	0.003087	0.989829	0.000551
0.925549	0.010840	0.953713	0.006521	0.975215	0.003027	0.990056	0.000512
0.926166	0.010749	0.954198	0.006444	0.975570	0.002968	0.990280	0.000473
0.926779	0.010658	0.954681	0.006368	0.975922	0.002909	0.990502	0.000435
0.927390	0.010567	0.955162	0.006291	0.976272	0.002851	0.990721	0.000397
0.927999	0.010476	0.955640	0.006215	0.976619	0.002793	0.990938	0.000360
0.928605	0.010386	0.956115	0.006139	0.976964	0.002735	0.991152	0.000323
0.929208	0.010295	0.956588	0.006064	0.977306	0.002678	0.991364	0.000286
0.929809	0.010205	0.957058	0.005989	0.977646	0.002621	0.991573	0.000250
0.930408	0.010116	0.957526	0.005914	0.977983	0.002564	0.991779	0.000214
0.931003	0.010026	0.957991	0.005840	0.978318	0.002508	0.991983	0.000179
0.931597	0.009937	0.958454	0.005766	0.978650	0.002452	0.992184	0.000144
0.932187	0.009848	0.958914	0.005692	0.978979	0.002397	0.992383	0.000110
0.932775	0.009759	0.959371	0.005619	0.979306	0.002342	0.992579	0.000076
0.933361	0.009671	0.959826	0.005546	0.979630	0.002288	0.992773	0.000042
0.933944	0.009583	0.960278	0.005473	0.979952	0.002233	0.992964	0.000009
0.934524	0.009495	0.960728	0.005400	0.980271	0.002180	0.993153	-0.000024
0.935102	0.009407	0.961175	0.005328	0.980588	0.002126	0.993339	-0.000056
0.935677	0.009320	0.961620	0.005256	0.980902	0.002073	0.993522	-0.000088
0.936250	0.009233	0.962062	0.005185	0.981213	0.002021	0.993703	-0.000119
0.936820	0.009146	0.962502	0.005114	0.981522	0.001969	0.993881	-0.000150
0.937388	0.009060	0.962939	0.005043	0.981829	0.001917	0.994057	-0.000181
0.937953	0.008973	0.963373	0.004973	0.982132	0.001865	0.994230	-0.000211
0.938515	0.008888	0.963805	0.004903	0.982434	0.001814	0.994401	-0.000241
0.939075	0.008802	0.964234	0.004833	0.982732	0.001764	0.994569	-0.000270
0.939632	0.008716	0.964661	0.004764	0.983028	0.001713	0.994735	-0.000299
0.940187	0.008631	0.965085	0.004695	0.983322	0.001664	0.994897	-0.000327
0.940739	0.008546	0.965507	0.004626	0.983613	0.001614	0.995058	-0.000355
0.941289	0.008462	0.965926	0.004558	0.983901	0.001565	0.995216	-0.000383
0.941836	0.008378	0.966342	0.004490	0.984187	0.001517	0.995371	-0.000410
0.942381	0.008294	0.966756	0.004422	0.984471	0.001468	0.995524	-0.000437
0.942923	0.008210	0.967168	0.004355	0.984751	0.001421	0.995674	-0.000463
0.943462	0.008127	0.967576	0.004288	0.985030	0.001373	0.995821	-0.000489

x/c	y/c	x/c	y/c	x/c	y/c	x/c	y/c
0.995966	-0.000514	0.997834	-0.000841	0.999126	-0.001020	0.999842	-0.000580
0.996109	-0.000539	0.997938	-0.000859	0.999192	-0.001010	0.999869	-0.000534
0.996249	-0.000563	0.998040	-0.000877	0.999255	-0.000997	0.999893	-0.000487
0.996386	-0.000587	0.998139	-0.000894	0.999315	-0.000980	0.999915	-0.000437
0.996521	-0.000611	0.998235	-0.000911	0.999373	-0.000961	0.999935	-0.000387
0.996653	-0.000634	0.998329	-0.000928	0.999429	-0.000938	0.999952	-0.000336
0.996783	-0.000657	0.998420	-0.000944	0.999481	-0.000913	0.999966	-0.000283
0.996910	-0.000679	0.998509	-0.000959	0.999532	-0.000885	0.999978	-0.000230
0.997034	-0.000701	0.998595	-0.000975	0.999579	-0.000854	0.999987	-0.000175
0.997156	-0.000722	0.998678	-0.000989	0.999624	-0.000821	0.999994	-0.000120
0.997276	-0.000743	0.998759	-0.001004	0.999667	-0.000786	0.999998	-0.000064
0.997393	-0.000763	0.998838	-0.001017	0.999707	-0.000749	1.000000	-0.000007
0.997507	-0.000783	0.998914	-0.001024	0.999745	-0.000709		
0.997619	-0.000803	0.998987	-0.001027	0.999779	-0.000668		
0.997728	-0.000822	0.999058	-0.001025	0.999812	-0.000625		